
Welcome!

Upper Middle River, Lewis Creek, Moffett Creek, Polecat Draft, Lower Middle River, South River TMDL Development

3/4/03

Acknowledgements

- Department of Conservation and Recreation
- Department of Environmental Quality
- James Madison University

Presentation Outline

- TMDL development overview
- Impairment description
- Bacteria TMDL model
  - Hydrology
  - Quality
- Benthic methodology

Total Maximum Daily Load

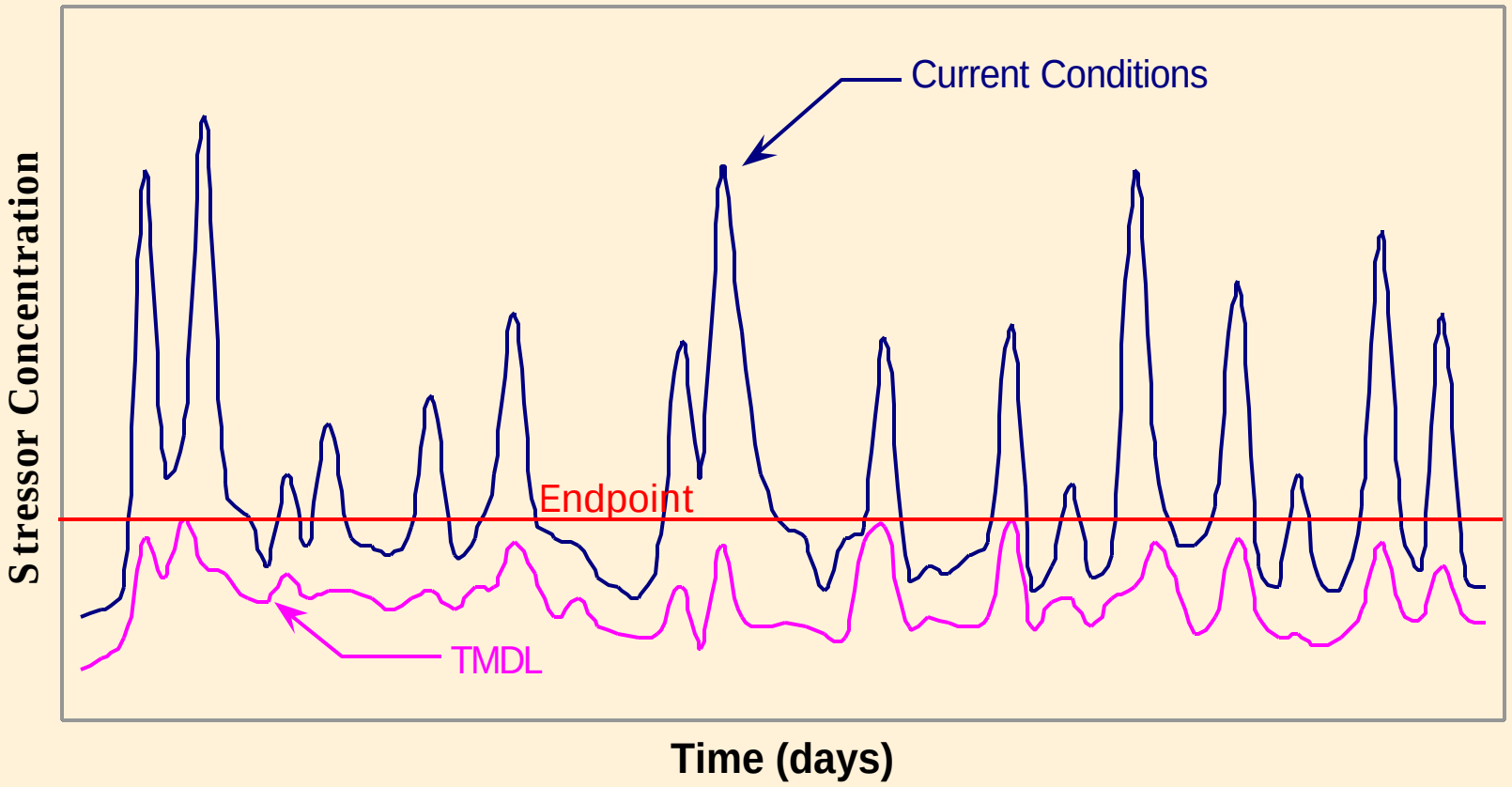
- Maximum amount of a pollutant that a water body can receive and still maintain water quality standards
- TMDL = WLA + LA + MOS

where WLA = waste load allocation

LA = NPS load allocation

MOS = margin of safety

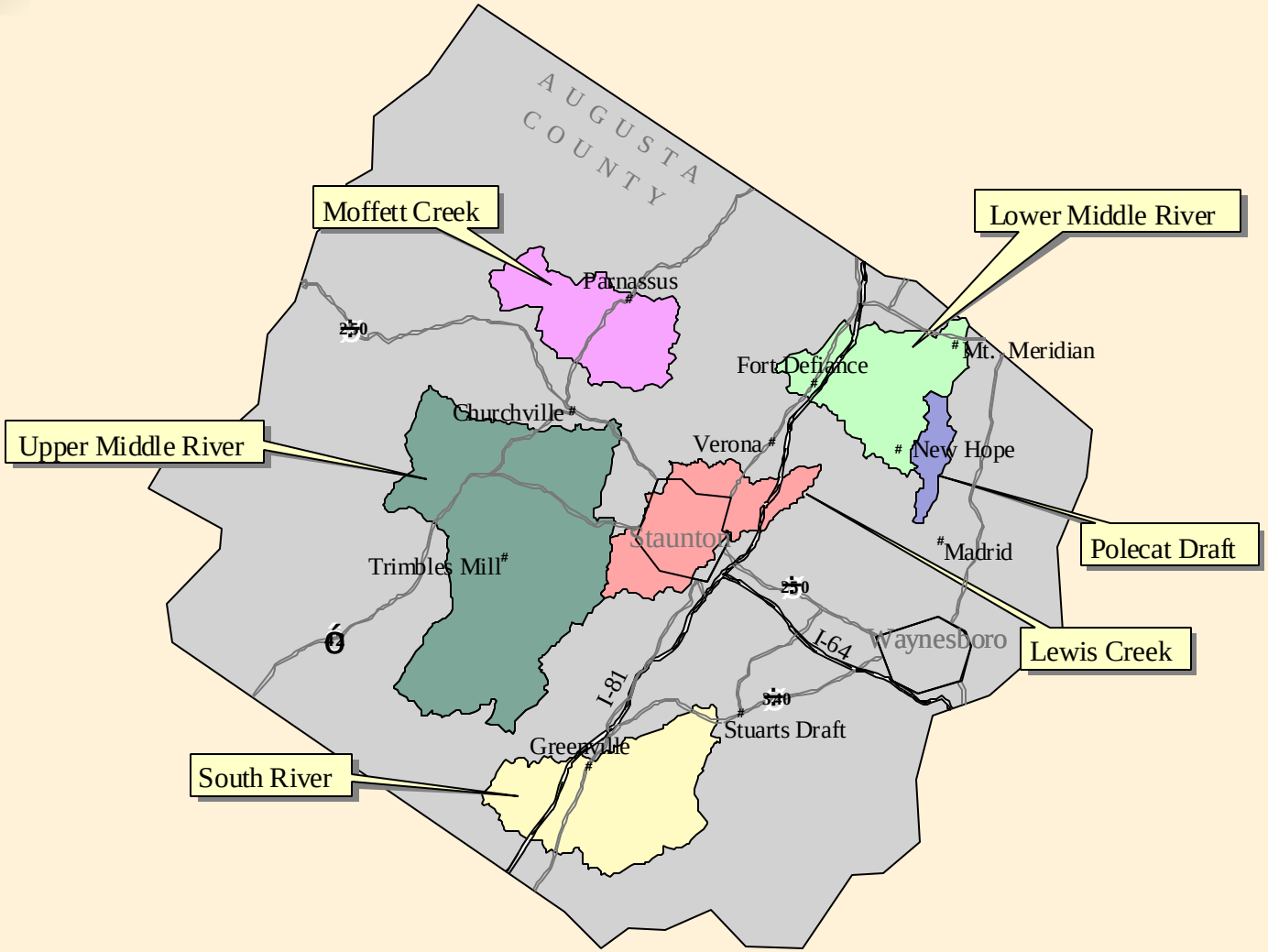
TMDL Development Process



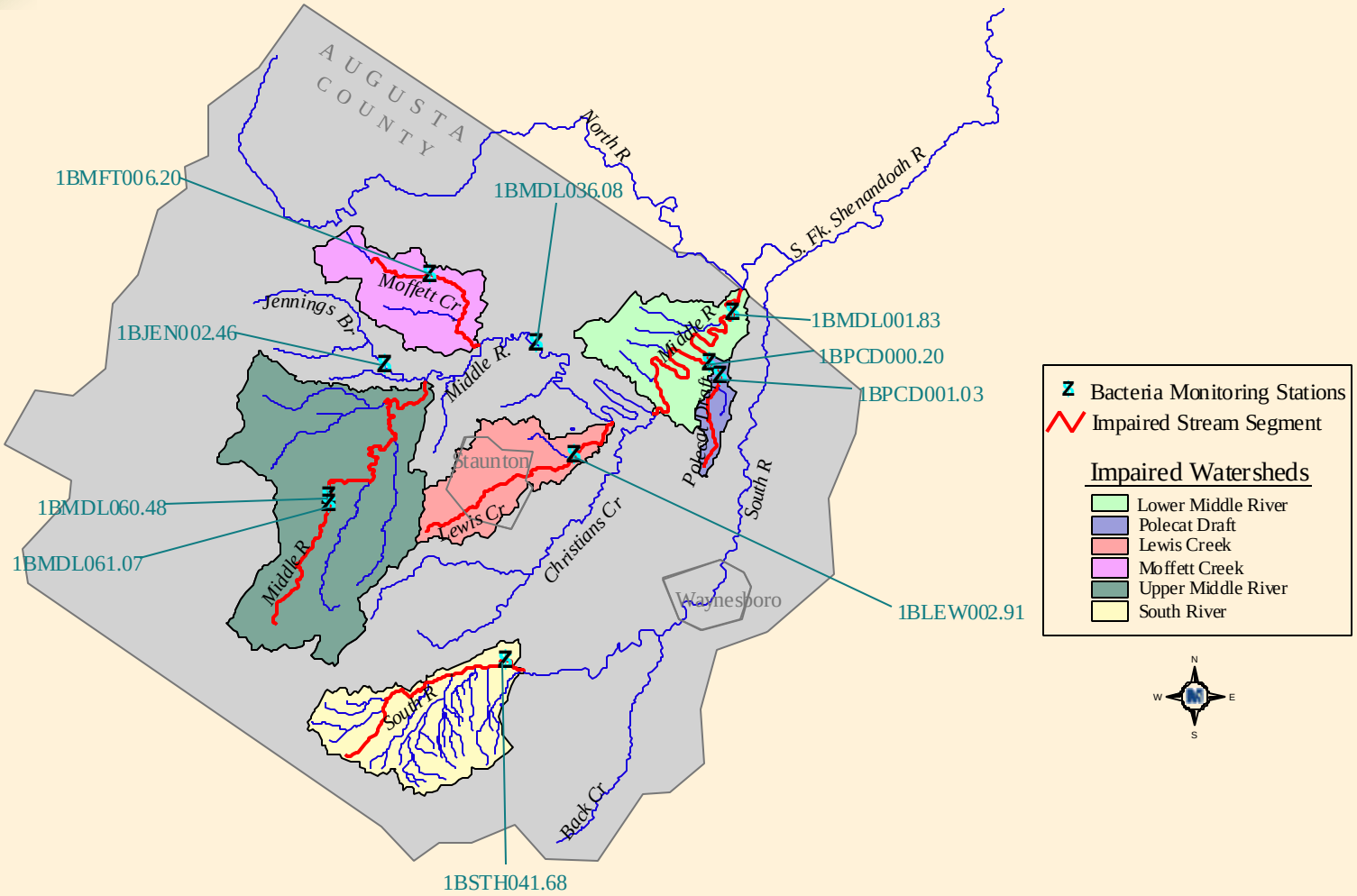
TMDL Endpoints

- Bacteria – *E. coli*
  - Instantaneous Max = 235 cfu/100ml
  - Geometric Mean = 126 cfu/100ml
- Benthic
  - Identify stressor(s)
  - Stressor concentration in reference watershed establishes endpoint(s)

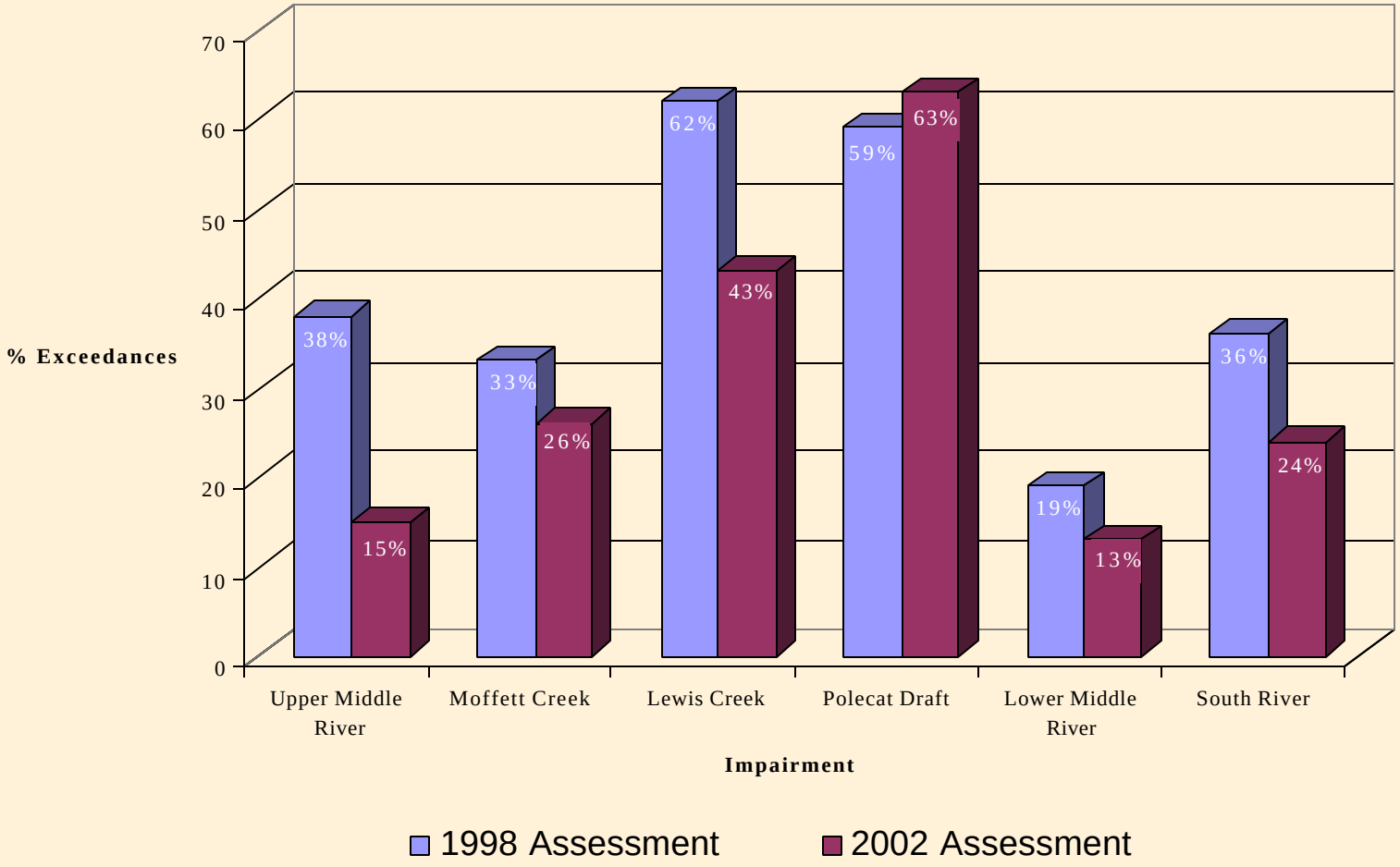
Middle & South Rivers TMDLs
Augusta County



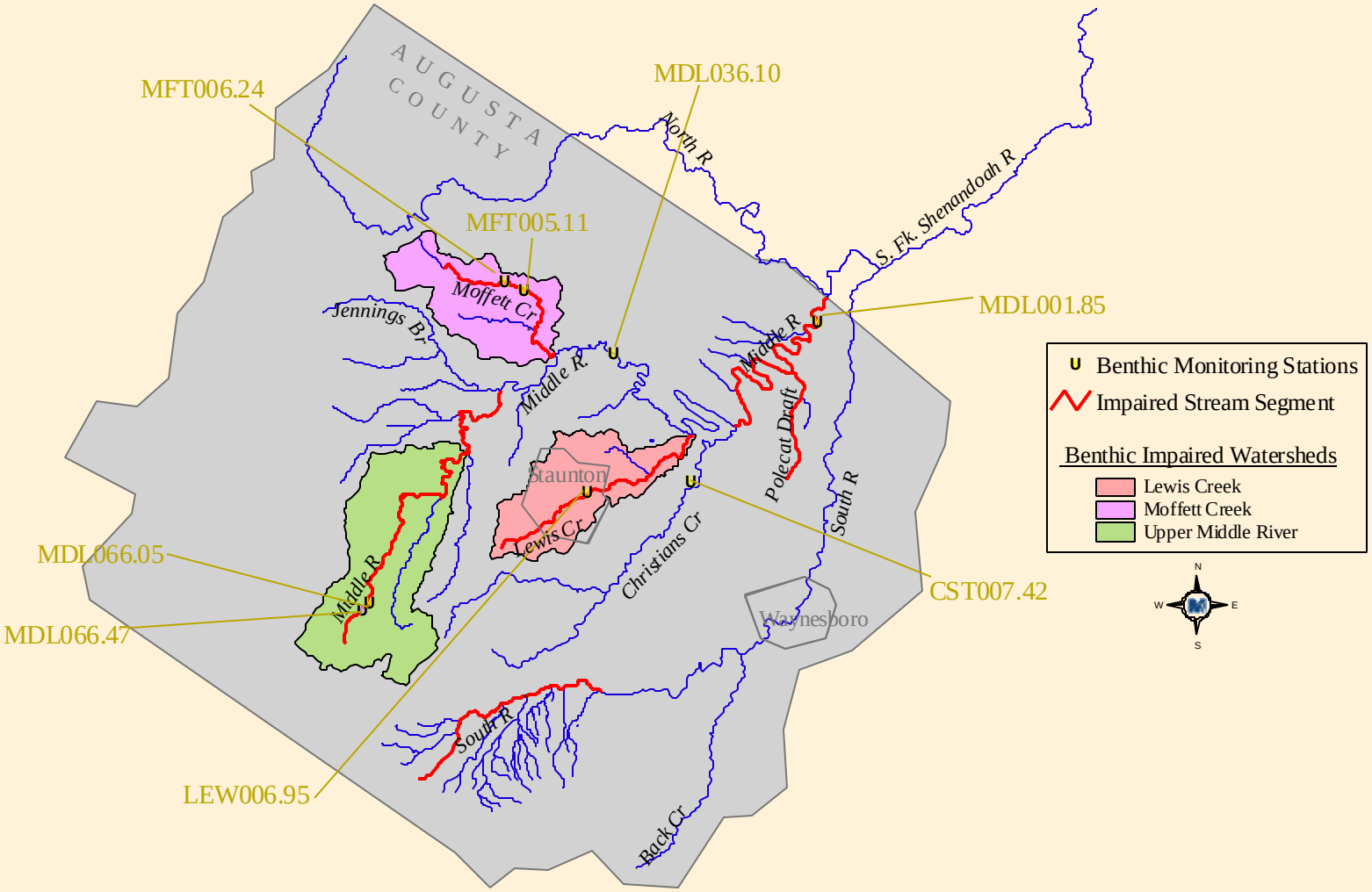
DEQ Bacteria Monitoring Network



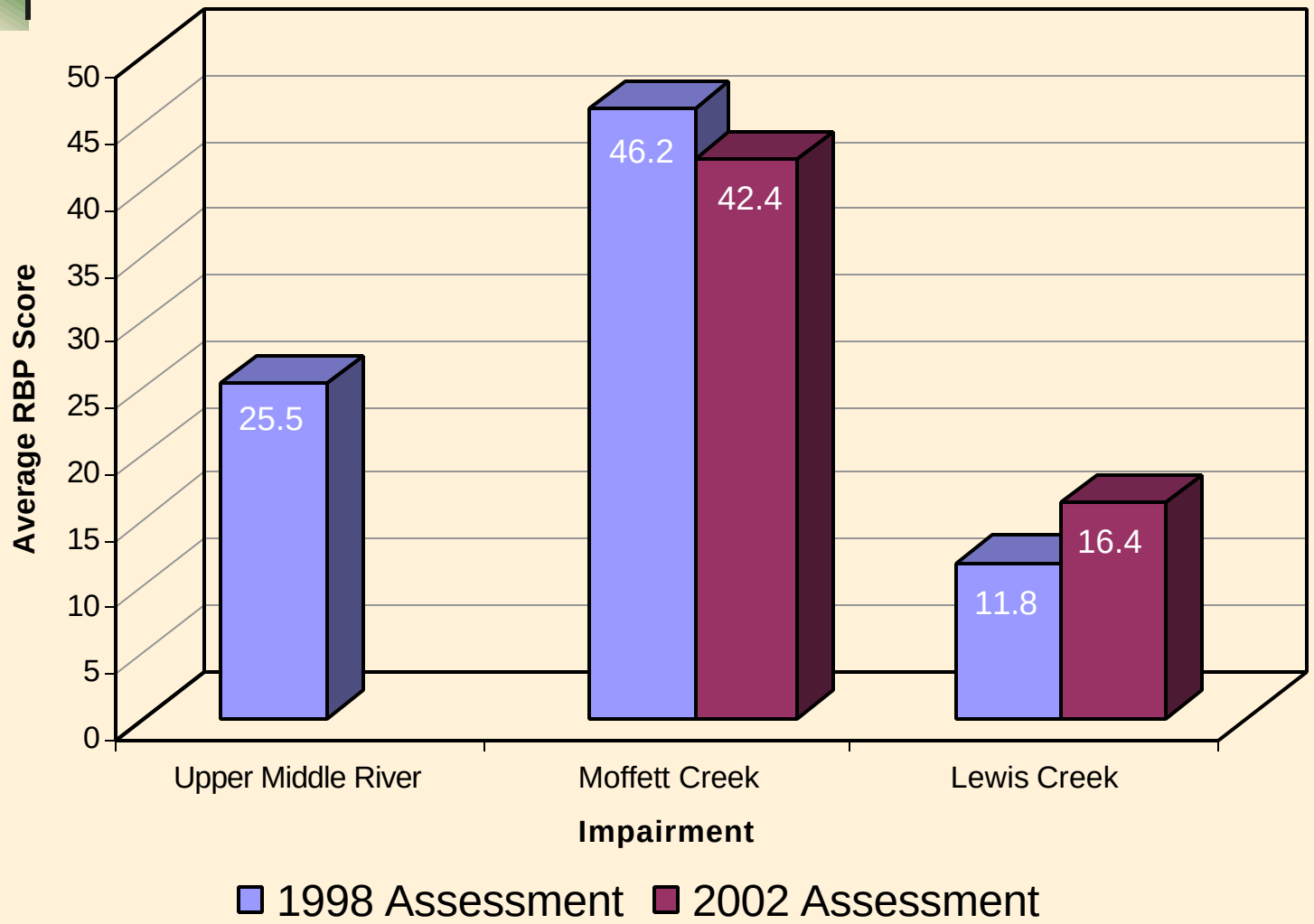
Fecal Coliform Standard Violations



DEQ Benthic Monitoring Network



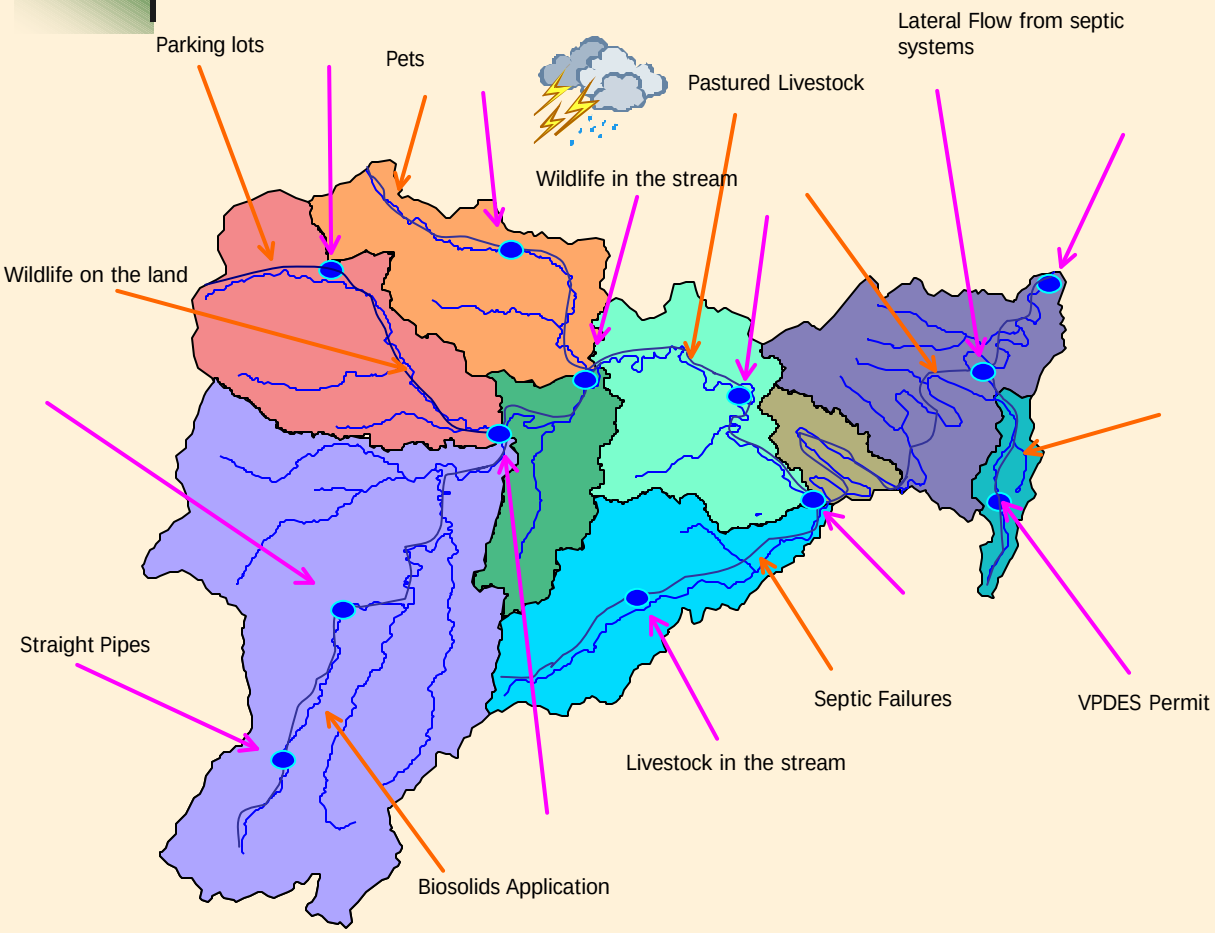
Benthic Data Summary



HSPF

- Hydrologic Simulation Program - Fortran
- Watershed-based
- Continuous time interval
- Land-applied, direct loads

Conceptual Model

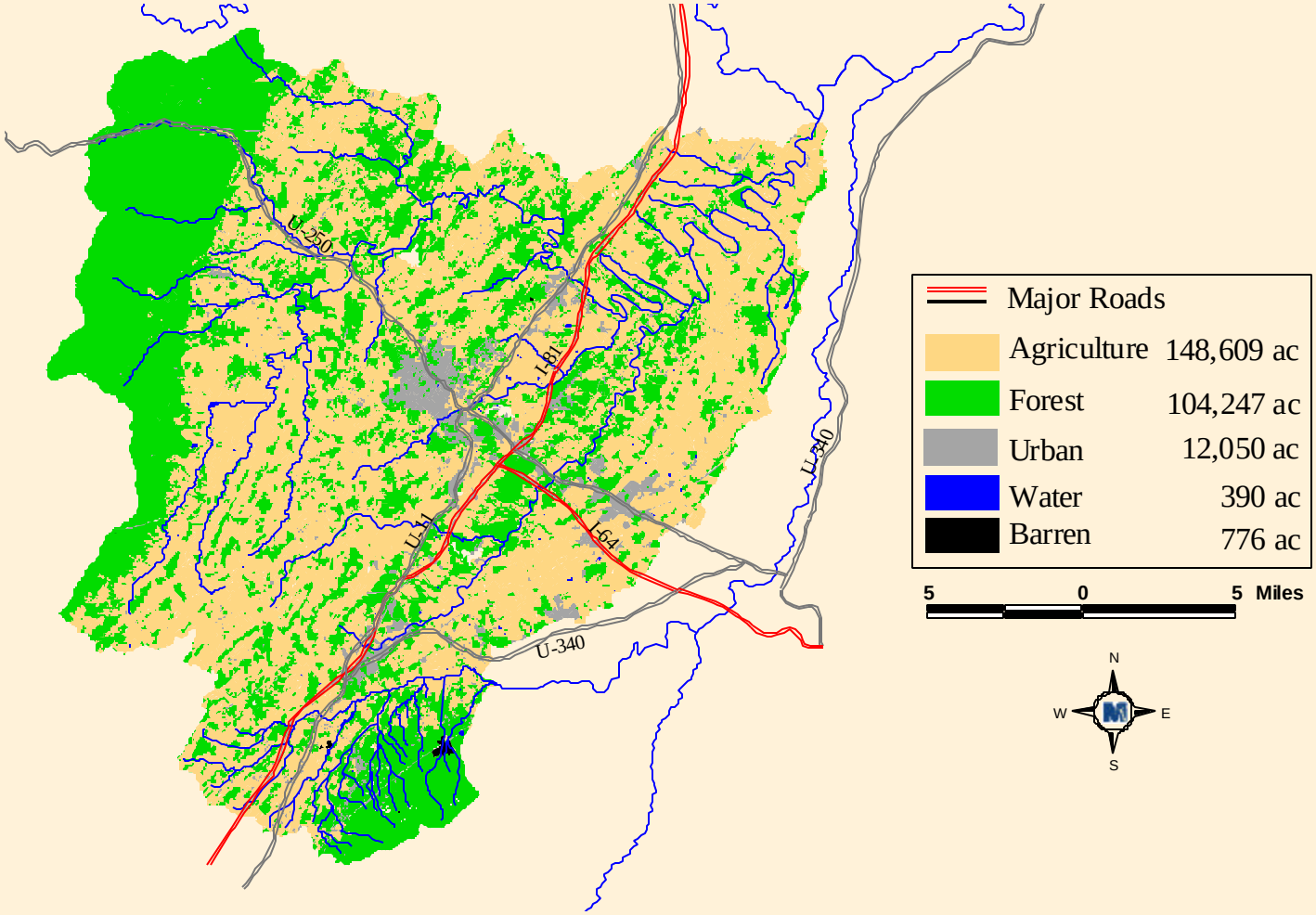


- Mathematical representation
- Overland
- Direct discharges
- Withdrawal

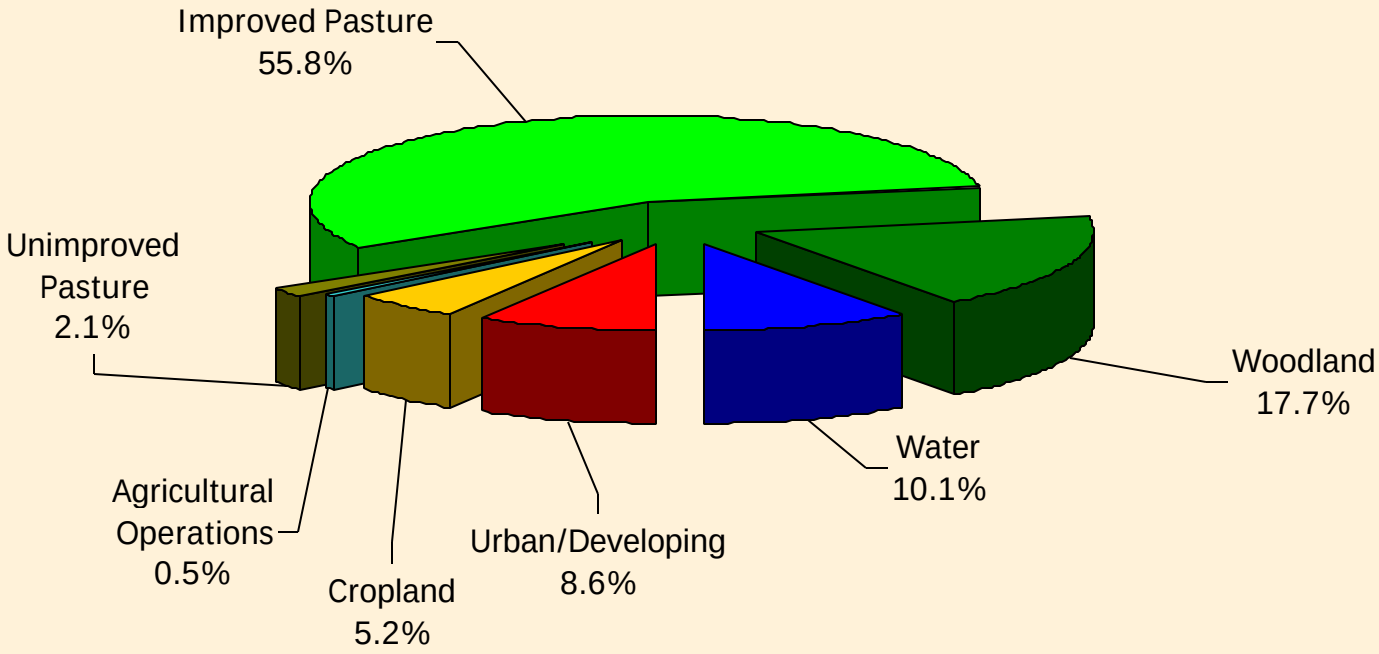
Hydrologic Modeling Components

- Climatic data
- Soils
- Topography
- Landuse
- Stream channel characteristics
- Point source discharge/withdrawal
- Flow data

Land use

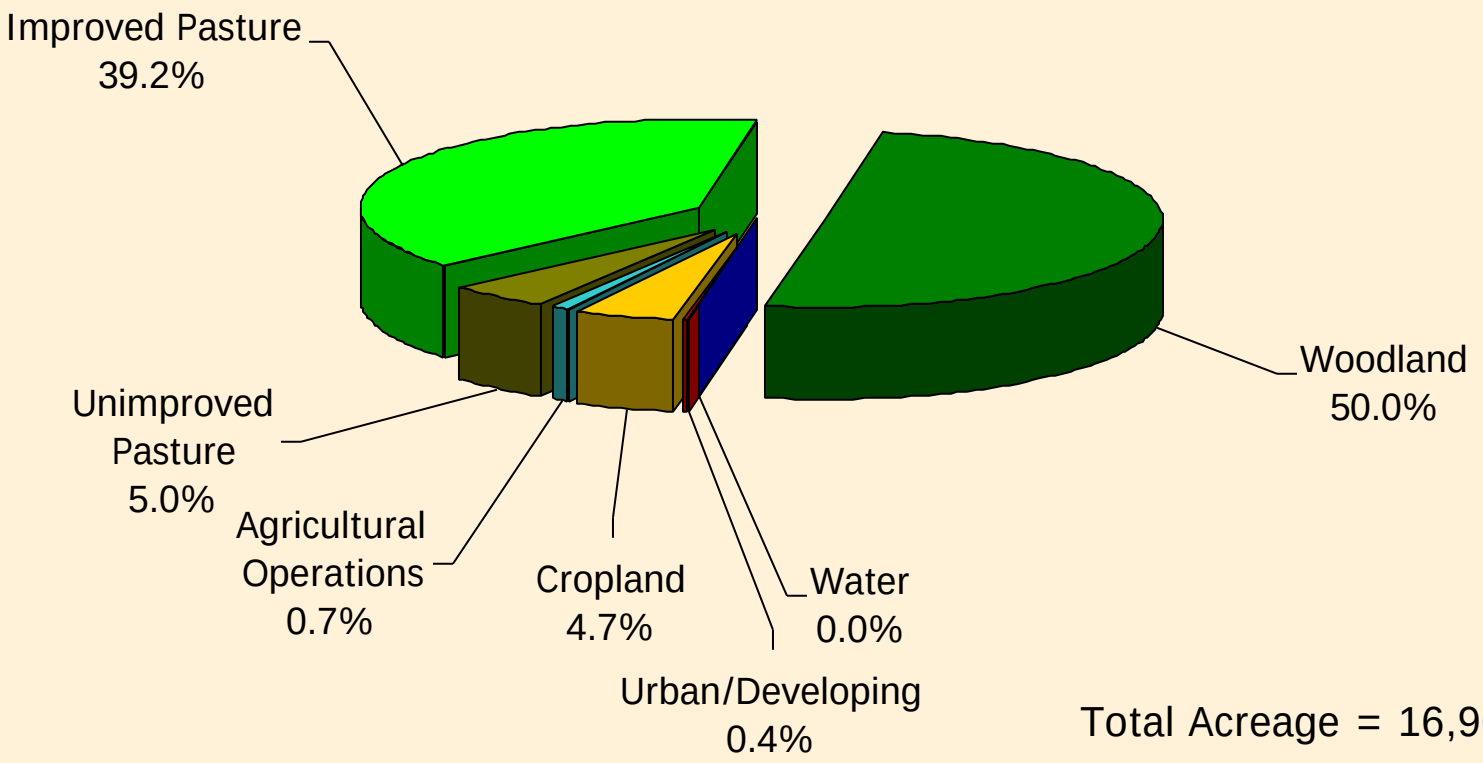

U-250
I-81
U-11
I-64
U-340
U-340
Major Roads
Agriculture 148,609 ac
Forest 104,247 ac
Urban 12,050 ac
Water 390 ac
Barren 776 ac
5 0 5 Miles
N
W
E
S

Land use, Upper Middle River



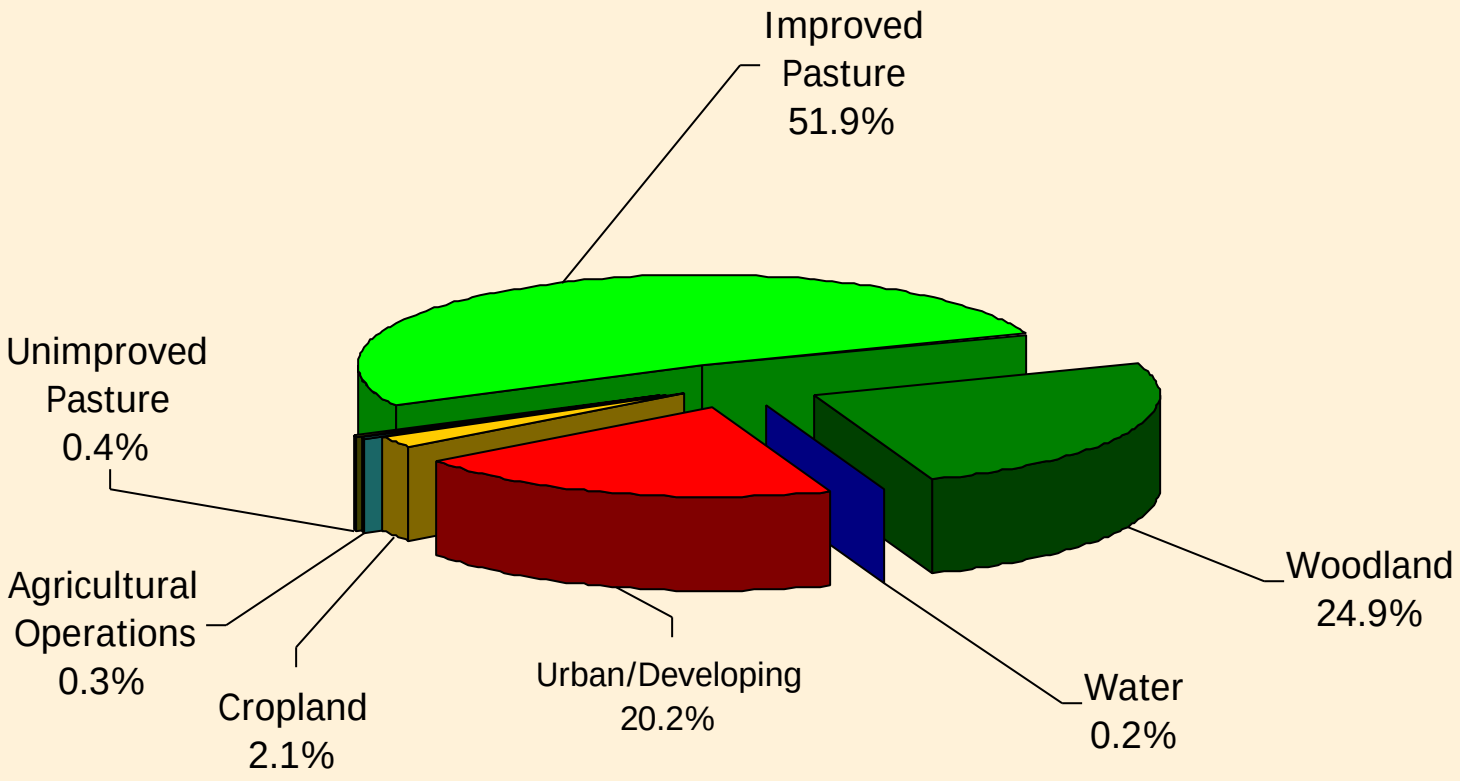
Total acreage = 49,646

Land use, Moffett Creek



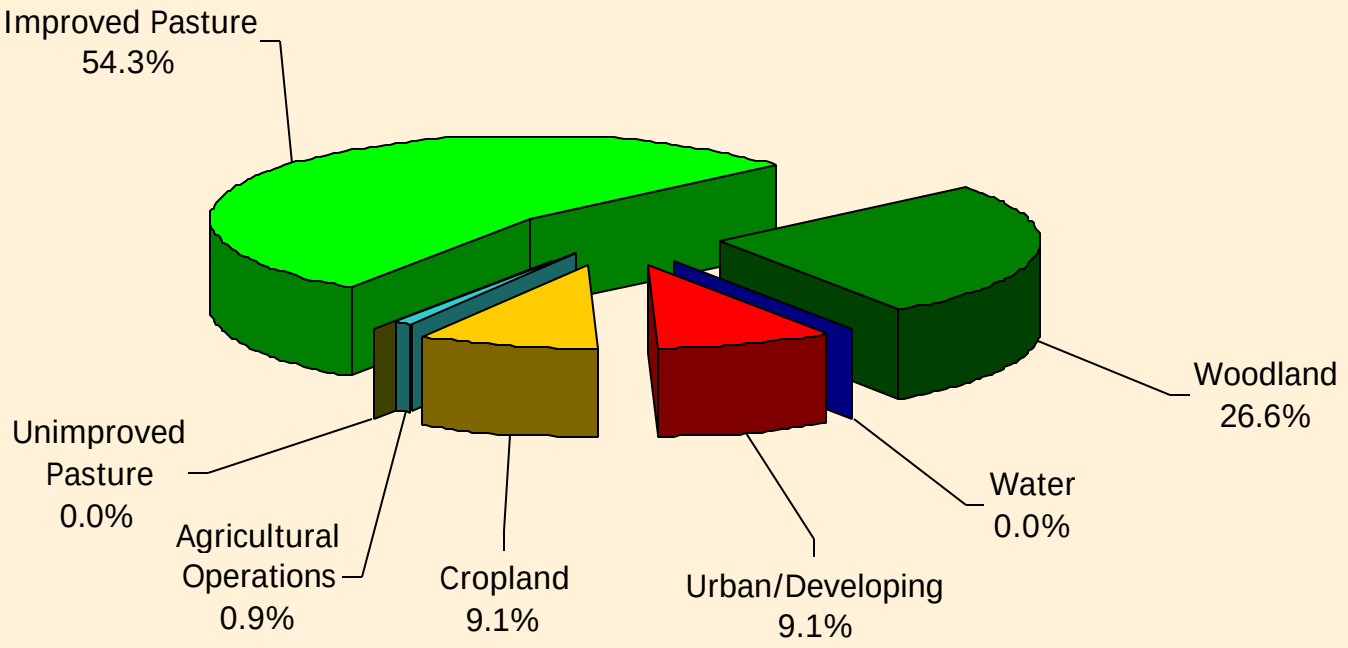
Total Acreage = 16,968

Land use, Lewis Creek



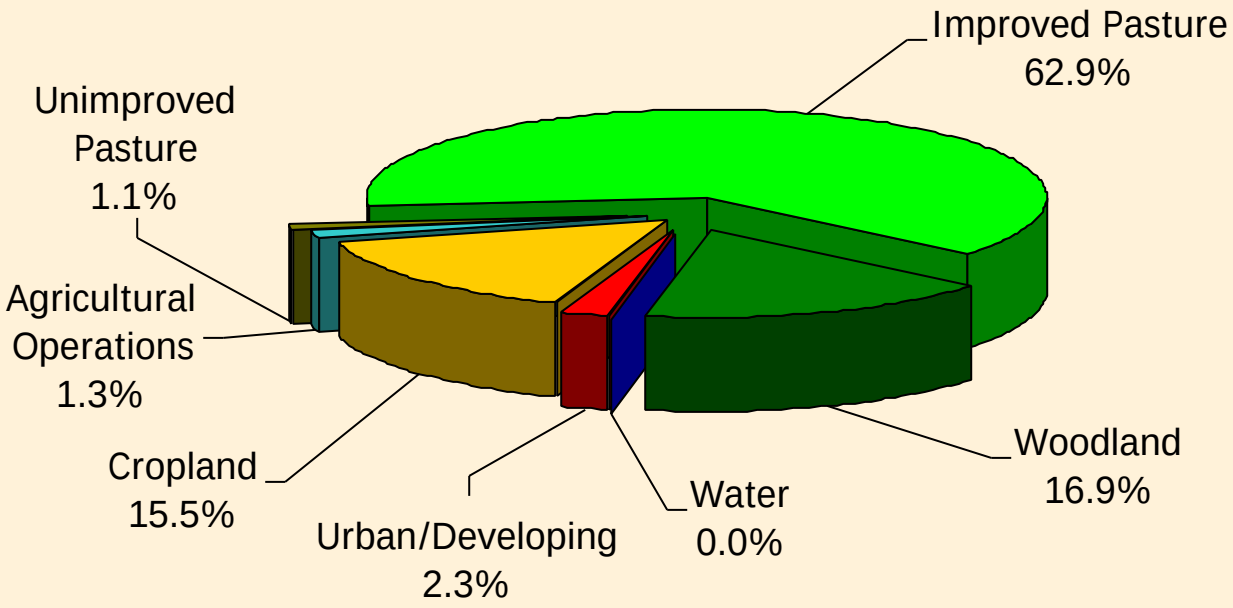
Total Acreage = 17,941

Land use, Polecat Draft



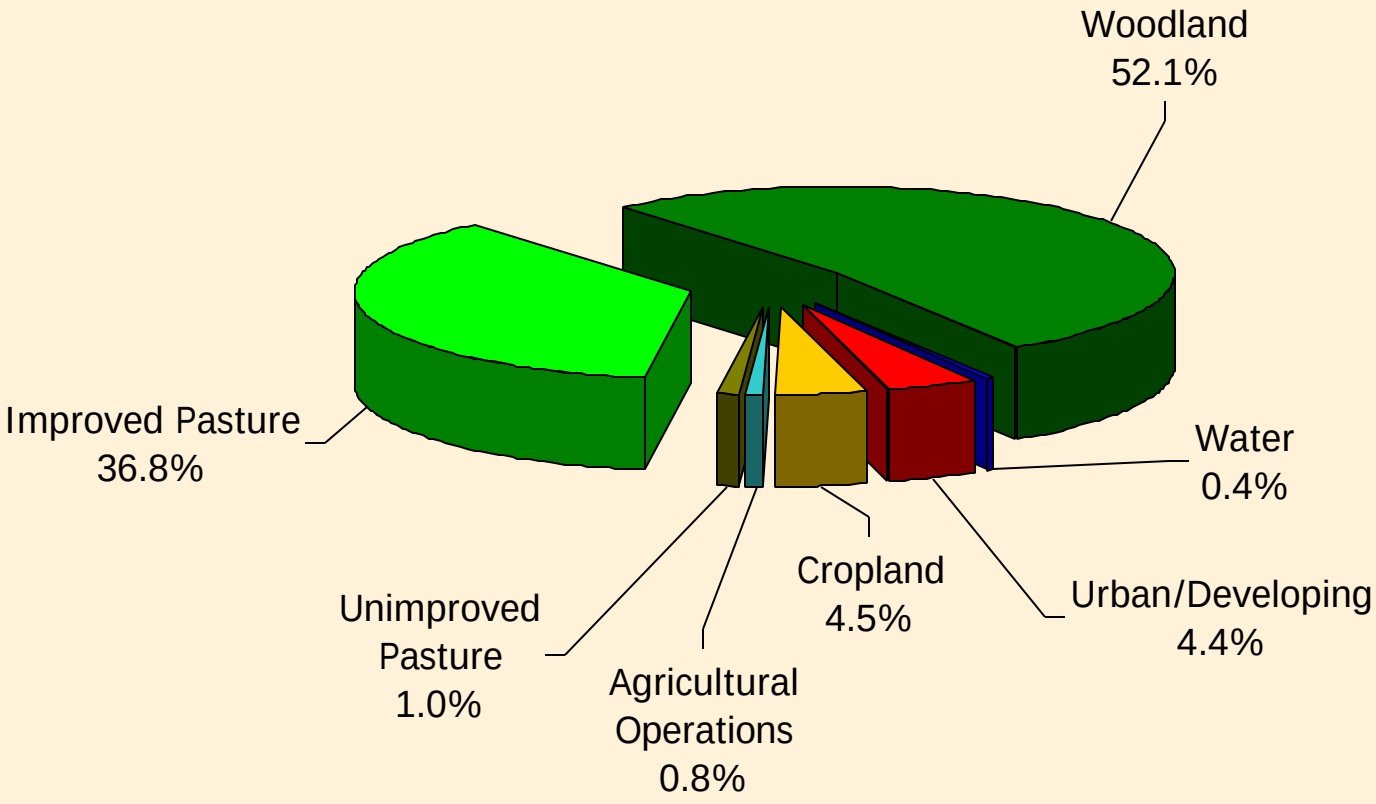
Total acreage = 3,510

Land use, Lower Middle River



Total Acreage = 19,242

Land use, South River



Total Acreage = 26,629

Water Quality Modeling Components

- Sources
  - Fecal production
  - FC densities
  - FC distribution
- Delivery Mechanisms
  - Direct
  - Land-applied
- Temporal Variation

Pollutant Sources

- Livestock
- Wildlife
- Human
  - Biosolids
- Pets
- Permitted discharges
  - Wastewater treatment facilities

Livestock Sources

- Population
  - Virginia Ag. Statistics
  - Consultation with Headwaters SWCD, Livestock Producers, VADCR, NRCS, Pilgrim's Pride
  - Watershed visits
- Distribution of waste
  - Pastured
  - Confined and waste collected
  - Direct deposition to the stream
- Seasonal varying applications

Livestock Population

Impairment	Beef	Dairy	Horse	Poultry	Turkey*	Sheep	Other+
Upper Middle	9,109	420	8	0	149,775	710	80
Moffett Creek	811	1,090	12	0	180,600	105	0
Lewis Creek	220	756	24	0	22,800	0	0
Polecat Draft	420	72	0	84,000	36,500	0	0
Lower Middle	2,412	3,860	0	231,500	88,500	100	0
South River	3,291	415	63	0	82,108	439	30

*Turkey includes Breeder, Finished Hen, Finished Tom and Brood to Move

+Minor sources such as Swine and Goats

Wildlife Sources

- Population based on data provided by VDGIF biologists, included:

  Raccoon **Muskrat** **Beaver** **Deer**

  Turkey **Goose** **Duck** *Other Sources*

- Distribution of waste based on habitat
  - Land-applied
  - Direct deposition to the stream
- Seasonal variations based on migration patterns and food sources

Human Sources

- Population, HU, OSTS based on U.S. Census
- Sanitary Sewer
  - Loading rates
    - Age of pipes
    - Overflows
  - Land-applied / direct deposition

Human Sources

- Septic Systems
  - Failure to soil surface throughout year
  - Lateral movement continuously to stream
- Straight Pipes
  - Direct continuous input into stream
- Biosolids
  - Land-applied

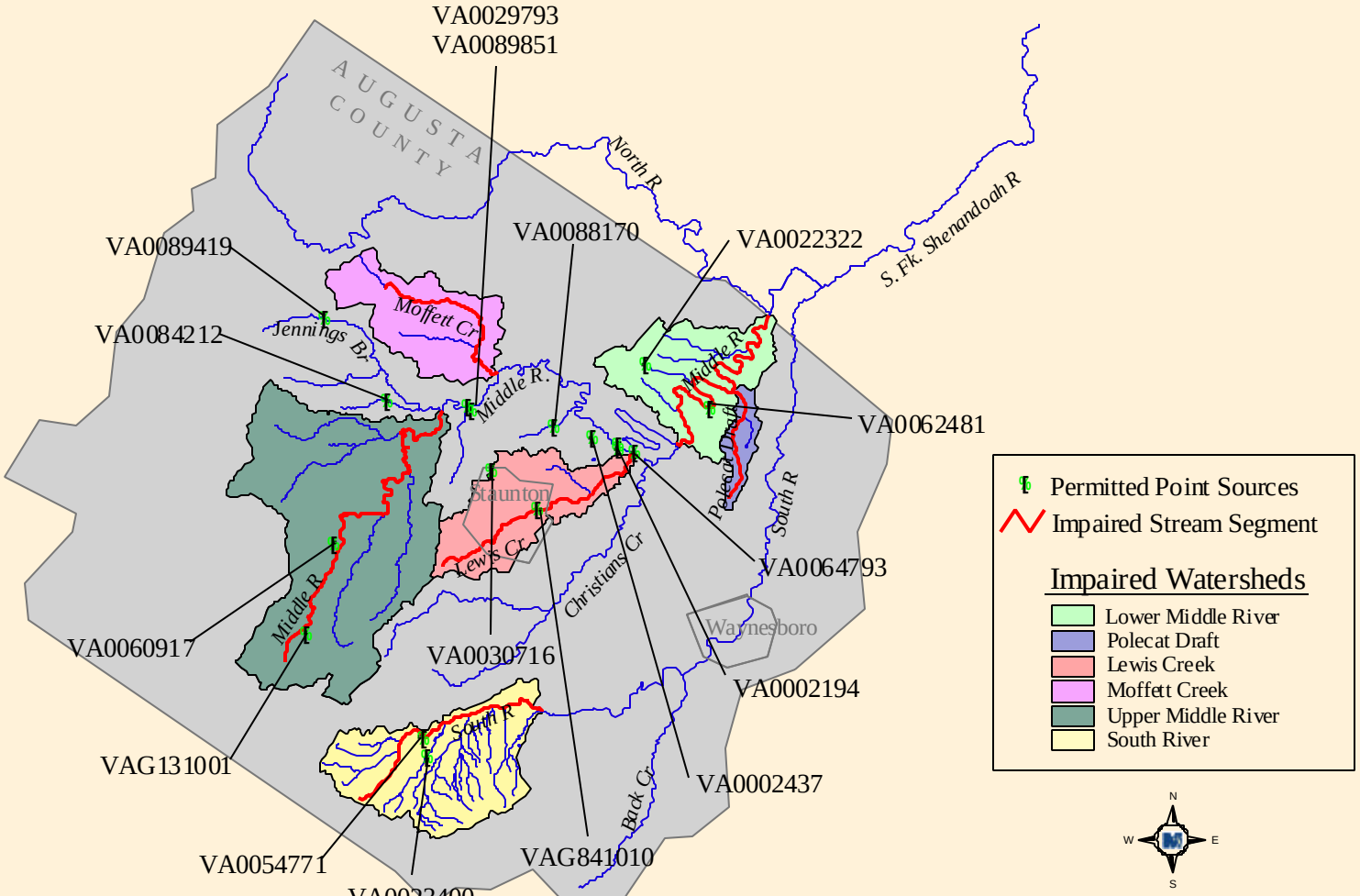
Human Population

Impairment	Population	Housing Units	Housing Units with sewer	Housing units with septic	Housing units with other
Upper Middle	3,716	1,522	21	1,393	107
Moffett Creek	2,644	1,103	8	1,029	66
Lewis Creek	24,694	10,978	10,245	659	74
Polecat Draft	484	183	16	159	7
Lower Middle	2,285	916	361	533	22
South River	3,877	1,460	145	1,259	56
Totals	37,699	16,161	10,795	5,033	333

Pet Sources

- Population/household based on literature values
- Translated to HU based on U.S. Census
- Land-applied

VPDES Permits



VPDES Permits

Watershed	Permit ID	Facility
Upper Middle River	VA0060917	Camp Shenandoah STP
Upper Middle River	VAG131001	Casta Line Trout Farms
Lewis Creek	VA0030716	Staunton WTP
Lewis Creek	VAG841010	Belmont Quarry Co.
Lower Middle River	VA0022322	ACSA-Mt. Sidney STP
Lower Middle River	VA0062481	ACSA-New Hope STP
South River	VA0054771	Greenville Car Wash
South River	VA0023400	Cold Spring Correctional Unit 10

VPDES Permits

Watershed	Permit ID	Facility
Jennings Branch	VA0084212	ACSA-Churchville WTP
Jennings Branch	VA0089419	White Way Lunch
Middle River	VA0002194	American Safety Razor
Middle River	VA0002194	American Safety Razor_002
Middle River	VA0002437	SnyderGeneral Corp
Middle River	VA0029793	Luck Stone-Augusta Plant
Middle River	VA0064793	Middle River Regional STP
Middle River	VA0089851	Churchville STP
Middle River	VA0088170	ACSA-Verona Water System

Benthic TMDL Development

- Stressor analysis
- Endpoints
- Reference watershed selection
- Source assessment
- Model similar to bacteria impairments

Stressor Analysis

- Identify potential stressors
  - Streamwalks
  - Toxic pollutant analysis
  - Toxicity studies
  - Comparison with candidate reference watersheds
- Analyze data for each potential stressor
- Determine most probable stressor(s) for basis of TMDL

Stressor Analysis

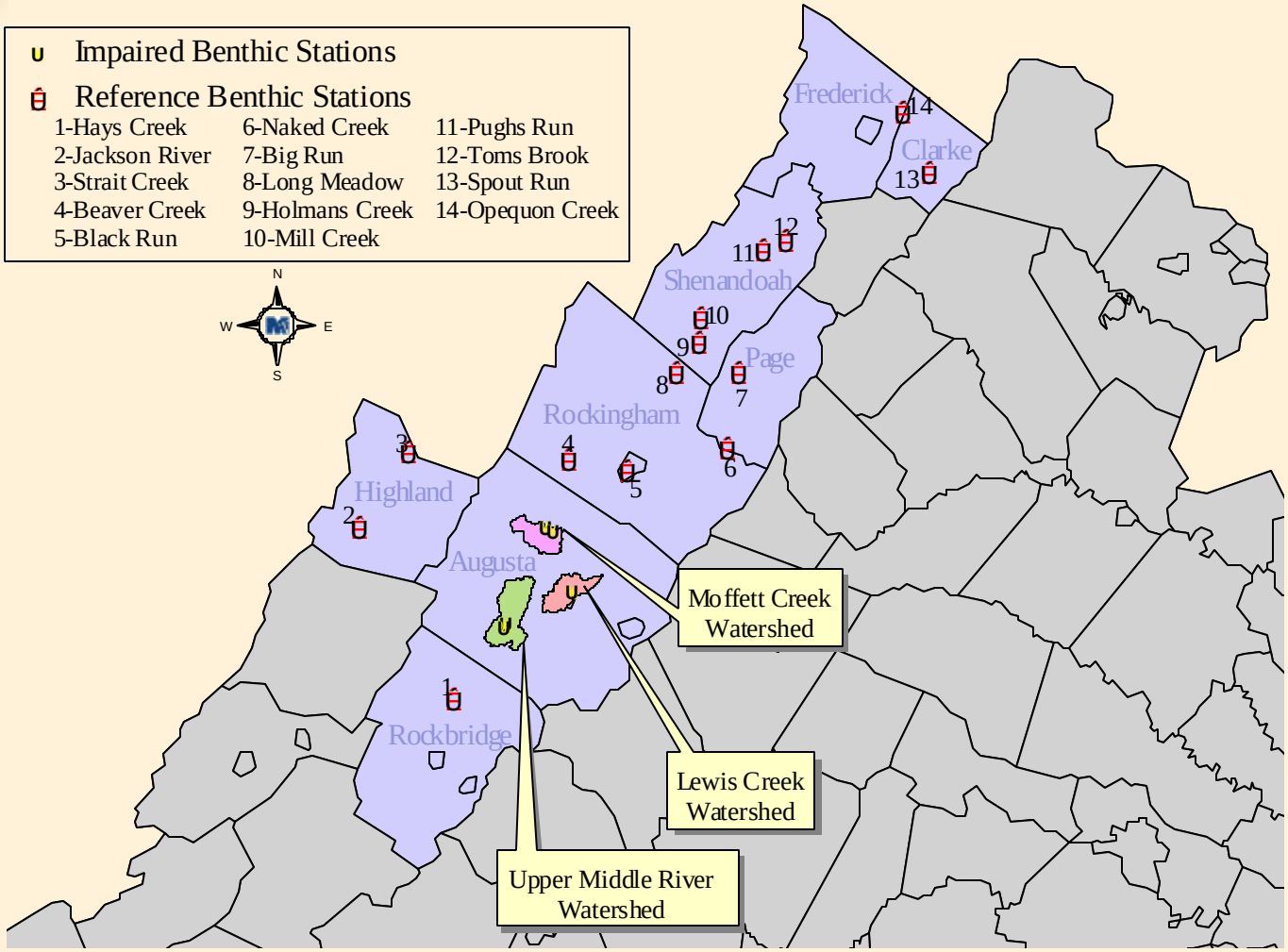
Potential Stressors

- Sediment
- Toxics
- Dissolved Oxygen (DO)
- Nutrients
- pH
- Metals
- Temperature
- Organic matter

Reference Watershed Selection

- Identify candidate based on:
  - Stream order
  - Eco-region
  - Non-impairment status
- Compare various watershed characteristics
  - Land use
  - Level of identified stressor(s)
- Select most comparable watershed

Potential Reference Sites



And then:

- Public Meeting 2 (Date?)
  - One each for FC and Benthic impairments
- Public Meeting 3 (Date?)
  - One each for FC and Benthic impairments
- Public Review
- Submit to EPA
- State Approval
- Implementation Plan Development
- Implementation

Middle River TMDLs
Augusta County

- Department of Conservation and Recreation, Division of Soil & Water Conservation
  - William Keeling, TMDL Project Manager, 804-371-7485
  - Mike Shelor, TMDL Project Coordinator, 804-786-7717
  - Tamara Keeler, Shenandoah Regional Manager, 540-332-8955
- Department of Environmental Quality
  - Sandra Mueller, TMDL Project Coordinator, 804-698-4324
- MapTech, Inc
  - Jim Kern, Project Manager, 540-961-7864
  - Email jkern@maptech-inc.com